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## Review on phytochemistry, therapeutic and pharmacological effects of myrtus (*Myrtus communis*)

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### ABSTRACT

The scientific name of Myrtle is *Myrtus communis* which widely used as a medicinal plant and herbal medicine. The extracts and essential oils of this medicinal plant contain special multiple pharmacological effects. Most plants in traditional medicine used for wide ranges of disorders such as urinary tract infections, digestive problems, bronchitis, sinusitis, dry cough, neurological problems (epilepsy), hemorrhoids, pyorrhoea, rheumatic pain, bloating, diarrhea, dysentery, hemorrhoids, interal wounds, rheumatism, inflammatory, bacterial infections, edema, spasm, depression, fungal, blood sugar, cough, chest pain and pain. They also are used as stimulant, tonic stomach and anti-parasites. Current studies mentioned the antimicrobial, antioxidant, anti-diabetic, analgesic, pesticide, hepatoprotective, anti-genotoxicity effects of myrtle. The essential oil mixtures contain cineole, myrtenole, pinene, geraniol, linalool, camphene, tannins, as well as oleic, linoleic, palmitic and citric acids and various sugars, which their therapeutic effects are probably due to these compounds. Discovering the different effects of this plant is important to produce effective natural remedies.

**Keywords:** Medicinal herbs, therapeutic effects, Myrtle, Myrtaceae, Iran

### INTRODUCTION

*Myrtus communis*, the Common Myrtle, is widely cultivated as an ornamental plant for use as a shrub in gardens and parks. It is often used as a hedge plant, with its small leaves shearing cleanly. When trimmed less frequently, it has numerous flowers in late summer. It requires a long hot summer to produce its flowers, and protection from winter frosts. The species and the subspecies of *M. communis* sub sp. *tarentina* have gained the Royal Horticultural Society's Award of Garden Merit [1]. Genesis is like the flowers of this shrub pink leaves mutual status and next to them, to join the stem. Each flower has 5 equally wide petals, so that it makes multiple flags and flowers profusely until the end of the rod and the connecting rod into the receptacle as a set of long, fine fibers revisable.

Thought to originate from Iran and Afghanistan, *Myrtus communis* has been cultivated throughout the Mediterranean region since the beginning of recorded history. The species type develops an irregular upright oval form, eventually becoming a small tree 4 to 4.5m tall in old age; plants are often shorn to maintain a lower profile,

say less than 1.5 or 2m [2]. Mort plant shown in Figure 1. The synonym names of *Myrtus* include *myrtus mucronata* pers and *myrtus italic* mill. The most important constituents of myrtle oil (up to 0.8% in the leaves) are myrtenol, myrtenol acetate, limonene (23%), linalool (20%), pinene (14%), cineol (11%), furthermore, *p*-cymene, geraniol, nerol, phenylpropanoid and methyleugenol. There is considerable variability in the composition of oil from different locations [3,4]. Mort is used for topical treatment of herpes simplex type 1 and 2 and the nasal mucosal inflammation [4]. The leaves, fruits and flowers on the stems of this shrub have medicinal properties. It grows more in northern of Iran, Fars, Kerman, Bandar Abbas, Yazd, Ilam, and Gilan-e Gharb. Mort grows in areas around the Mediterranean and temperate climate and it is used as ornamental plant [5]. In some parts of the world, Mort fruit is used raw or cooked, fresh or dried. Dried fruit consumption is very common, especially in the Middle East. Flowers and fruits are used as the aroma and flavor in sauces and syrups. Fruits are used for acidic drinks. The aromatic leaves are used against bloodshed and for increasing tonic. Recently substances with antibiotic properties have been extracted from this plant. The active ingredients are quickly absorbed within 15 minutes and urine becomes purple color. Mort edible products are effective in treating urinary tract infections, digestive problems, bronchitis, sinusitis and dry cough. In India mort food products are used for neurological problems, especially for epilepsy and its topical products for infections and hemorrhoid and its leaf oil is used for pyorrhea treatment. The essential oil in topical products is used for rheumatoid pain. Fruit has carminative properties and effective in the treatment of diarrhea, dysentery, hemorrhoid, internal wounds and rheumatism. It has analgesic, anti-bacterial, anti-edema, antispasmodic, anti-astringent, anti-carminative, antidepressants, fungicide, anti-diabetic, expectorant, anti-chest pain, analgesic, stimulant, parasiticide and stomach tonic effects [6- 8].

This plant was used as a medicinal household plant, in many cultures, from Africa to Northern Europe. The plant oils were used to reduce acne and skin diseases. In Turkey, the oil of leaves are used to lower blood sugar in diabetic patients and dried leaves of the plant are used to lower blood glucose in diabetic patients. In the Mediterranean regions, the tea is used to treat urinary tract infections and bladder [9]. The aim of this study was to report the traditional and modern effects and phyto-chemical composition of *Myrtus communis*

## MATERIALS AND METHODS

In this review article, to collect data, different combinations of keywords "*medicinal plants*", "*Myrtus communis*", "*Iran*" and "*Phytochemical compounds*" and their Persian equivalents were entered into databases consisting of Magiran, SID, and Iranmedex, as well as, international databases of Web of Knowledge, Pubmed and Google scholar. The articles only in English and Persian languages published between 1976 and March, 2015 were searched for. Finally 23 articles were included in the study (Figure 1).

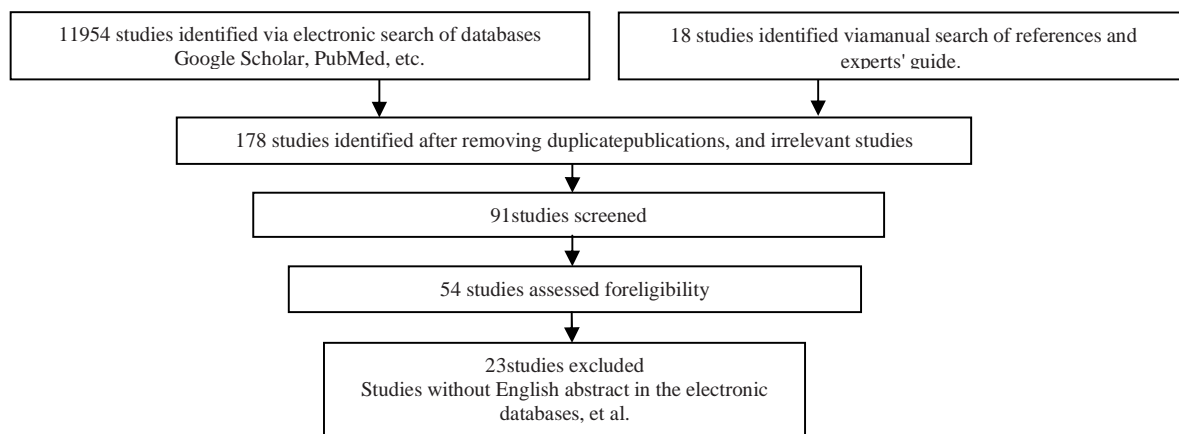


Figure 1: Flow diagram for the study review

**Table 1: Various health information of myrtus**

Antioxidant activity	The antioxidant activity of essential oils and flowers in DPPH method at a dose of 200 micrograms/ml showed 89.15± 2.01 %, while vitamin C had antioxidant activity 93.04± 1.01 % which revealed Mort plant flower essence has a good antioxidant activity [10]. Results showed that essential oil of leaf had an ability to reduce DPPH radical up to 50 percent with an IC50 of 5.99 micro/ml [11]. Myrtus fruit methanol extract showed high antioxidant activity (82.5%) [12].
Antibacterial activity	In a study reported strong antimicrobial effect of essential oil of Myrtus against <i>S. aureus</i> , <i>S. epidermidis</i> , <i>B. subtilis</i> , <i>E. coli</i> and <i>Serratia marcescens</i> [13]. Myrtus essential oil antibacterial effects against yeast <i>Candida albicans</i> and <i>E. coli</i> have been studied and antibacterial effects were attributed to biological materials such as alpha-pinene, 8 V1-cineole, limonene and linalool [14]. The combination of essential oils of <i>Myrtus communis</i> 4% and 1% essential oil of <i>Eugenia caryophyllus</i> had very strong antimicrobial effects. The antimicrobial effects of the compound against several bacterial and fungal strains such as <i>Staphylococcus aureus</i> , <i>Streptococcus pneumoniae</i> , <i>Pseudomonas aeruginosa</i> , <i>Candida albicans</i> , <i>Aspergillus flavus</i> , <i>Cryptococcus neoformans</i> , <i>Aspergillus niger</i> , <i>Trachophyton vericucosum</i> and <i>Trachophyton mentagrophyte</i> were proved [15].
Hepatoprotective activity	The hydraulic extraction effects of <i>Myrtus communis</i> were carried out on serum parameters and items such as glutamate-pyruvate transaminase, total protein, serum glutamate oxaloacetate- transaminase, serum alkaline-phosphatase and bilirubin and the results showed that the aqueous extract in doses of 200mg/kg and 400mg/ kg body weight had a significant effect on liver enzymes [16].
Analgesic activity	Narcotic /analgesic properties of leaf extract at a dose of 150mg / kg achieved in animal models [17].
Anti-diabetic activity	Mort phenol compounds at a dose of 800mg/ kg body weight have shown anti-diabetic effects [18].
Insecticidal and repellency activity	Combined 1& 8-cineole <i>M. communis</i> had 18-23% lethal effect. The essential oil at a dose of 1.6 mg/ square centimeter had 62.2% insecticidal effect against <i>Plasmodium papatasii</i> [19]. In another study it was found that the essential oil of Mort had insecticidal effect on <i>E. kuehniella</i> , <i>P. interpunctella</i> and <i>A. obtectus</i> there. It has been found that effective compounds against insects of <i>S. oryzae</i> and <i>R. dominica</i> are V8-cineol and linalool [20].

## Chemistry

The chemical compositions of different parts of myrtus including leaves, fruits and flowers are shown in Table 2.

**Table 2: The chemical composition of different parts of myrtus**

Phytochemical compounds of Mort	Leaves	Alpha-pinene(37.8%), 1V8-cineole (23.1%), limonene(17.1%) and linalool(10.1%) [21].
	Fruit	Flavonoids such as quercetin, catechin, myricetin [22].
	Flower	Flavonoids, such as alpha-pinene(48.54%), 1V2-cineole (14.75%), (5.01) myrtenal, myrtenol (4.01), myrtenyl acetate (3.45), myrcene (2.09), linalool and geraniol (2.01& 1.67) [10].

## DISCUSSION

The main objective of this study was to demonstrate the properties of biological and pharmacological traditional plant and to identify its potential effects as a drug combination. Current studies have revealed antimicrobial, antioxidant, anti-diabetic, analgesic, pesticide, hepato-protective and anti-parasite effects of *Myrtus communis*. The new science findings showed that this plant contains cineole, myrtenol, pinene, geraniol, linalool, camphene, tannins, acids, oleic, linoleic and palmitic and citric acids and contains various sugars, which extended its therapeutic effects might be belonged to these compounds. By the way, the findings showed that the active ingredients could have strong medicinal potential.

Although the exact mechanism actions of this plant on various diseases are not clear and the above mentioned by-products might be involved in therapeutic effects of this plant, however, this plant possesses high level of phenolic compounds [3]. Phenolic compounds have been shown to be effective in various diseases including neurological disorders [23,24], chronic inflammation, damages during ischemia/reperfusion [25,26], diabetes [27,28], atherosclerosis [29,30], cardiovascular diseases [31,32] and wound [33,34].

Furthermore, phenolic compounds have antioxidant activities which, in turn, are effective in various hard curable diseases [35-38]. In fact, oxidative stress which is the predominant cause of various diseases is produced by free radicals [39-46]. Hence, antioxidants, especially medicinal plants with antioxidant activity have the ability to counteract these conditions by alterations in redox state [47-79]. Various clinical and experimental studies have demonstrated promising results for various conditions especially for the treatment and prevention of life threatening diseases [80-83]. These agents are also effective in inhibition of toxic agents induced complications [84,85]. Hence, *Myrtus communis* which possesses high level of phenolic compounds and antioxidant activity may act, at least in part, by these compounds.

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